FIRSOV, L.V.

New data on the age of phlogopite in the Aldan. Dokl. AN SSSR 161 no.3:679-682 Mr '65. (MIRA 18:4)

1. Institut geologii i geofiziki Sibirskogo otdeleniya AN SSSR. Submitted October 31, 1964.

FIRSOV, L.V.

Absolute age of granitoids in the Taygonos Peninsula.
Dokl. AN SSSR 162 no.2:414-417 My '65. (MIRA 18:5)

1. Institut geologii i geofiziki Sibirskogo otdeleniya AN SSSR.
Submitted October 31, 1964.

FIRSOV, L.V.

Late Mesozoic igneous activity in the central range of Kamchatka and the multiple metamorphism of ancient formations related to it. Geol. i geofiz. no.3:89-97 '64. (MIRA 18:7)

1. Severo-Vostochnyy kompleksnyy nauchno-issledovatel'skiy institut Sibirskogo otdeleniya AN SSSR, g. Magadan.

TOMIRDIARO, S.V.; GOL'DTMAN, V.G., nauchnyy red.; SHILO, N.A., red.; KARTASHOV, I.P., red.; DIKOV, N.N., red.; DRABKIN, I.Ye., red.; ZIL'BERMINTS, A.V., red.; NIKOLAYEVSKIY, A.A., red.; FIRSOV, L.V., red.; YANOVSKIY, V.V., red.

[Thermocalculations of foundations in the regions of permafrost.] Teplovye raschety osnovanii v raionakh vechnoi merzloty. Magadan, 1963. 104 p. (Akademiia nauk SSSR. Sibirskoe otdelenie. Severo-Vostochnyi kompleksnyi nauchno-issledovatel'skii institut. Trudy, no.4) (MIRA 18:11)

GUSEL'SHCHIKOV, M.K., professor; GEYTMAN, M.G., redaktor; NAVROTSKIY, D.I., redaktor; FIRSOV, M.Ye., redaktor.

[Electric and gas welding in shipbuilding and ship repair] Elektricheskaia i gazovaia svarka v sudostroenii i sudoremonte. 2 izd., dop. i perer. Leningrad, Izd-vo Ministerstva morskogo i rechnogo flota SSSR, 1953. 397 p. (MLRA 7:7)
(Electric welding) (Oxyacetylene welding and cutting)
(Shipbuilding)

SOV/137-58-7-15203

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 183 (USSR)

AUTHORS: Matskevich, V.D., Firsov, M.Ye.

TITLE: Teaching Methods Employed in Presenting a Course in Welding to Students of the Leningrad Ship-building Institute (Metodika prepodavaniya kursa svarki studentam Leningradskogo korablestroitel'nogo instituta)

PERIODICAL: Tr. Leningr. korablestroit. in-ta, 1956, Nr 19, pp 109-120

ABSTRACT: The teaching methods described are employed for presentation of a welding course and include the following four types of instruction: 1) Practical instruction in arc welding in the shop; 2) study of theoretical aspects of welding and welding equipment; 3) laboratory instruction in welding and electrical welding equipment; 4) design planning of welded constructions and engineering processes of welding. The authors describe in detail the teaching methods employed in various courses and the contents of the latter, as well as methods and contents of laboratory projects and course planning.

A.P.

Card 1/1

1. Personnel--Training 2. Welding--Study and Teaching

FIRSOV, M.Ye., inzh.

Experience in the operation of small dredges connected with SMD-2 peat spreaders. Torf. prom. 35 no.2:35-37 '58. (MIRA 11:5)

1. Orud'yevskoye torfobriketnoye predpriyatiye.
(Peat machinery)

SOV/85-58-11-13/33

AUTHOR: Firsov, N., Leader (Commander) of Parachutist Team of the Estonian Republic Aviation Sports Club, Tallin

TITLE: Precision Landing on the Sea (Na tochnost' privodneniya)

PERIODICAL: Kryl'ya rodiny, 1958, Nr 11, p 14 (USSR)

ABSTRACT: The author reports on the first competitions in precision landing on the sea held by parachutists of the Estonian Republic under the auspices of the DOSAAF Republic committee. The contestants included sportsmen from Tallin, Tartu, Pyarnu, and Valgi, who jumped from an An-2 plane from an altitude of 800 m. The rules of the competition are stated and several winners mentioned.

ASSOCIATION: Estonskiy respublikanskiy aviasportklub (Estonian Republic Aviation Sports Club.

FIRSOV, N.I.

Developing state vegetable and fruit farms in the region of the TSimlyansk Hydro development. Kons. i ov. prom. 13 no.10:27-29 O '58. (MIRA 11:10)

1.Rostovskiy sovnarkhoz.
(Rostov Province--Fruit culture)
(Rostov Province--Vegetable gardening)

FIRSOV, N.I.

Obtaining high yields of cherries on Rostov Province state farms. Kons. i ov. prom. 14 no.3:27-29 Mr '59.
(MIRA 12:3)

1.Rostovskiy sovnarkhoz.
(Rostov Province--Cherries)

FIRSOV, N.I.

Developing the resources of raw products for the canning industry in the Rostov Economic Region. Kons.i ov.prom. 15 no.3:31-33 Mr '60. (MIRA 13:6)

1. Rostovskiy sovnarkhoz.
(Rostov Province--Canning industry)

FIRSOV, N.I.

Expand the sources of raw material supply of the canning industry under the Rostov Economic Council. Kons.i ov.prom. 17 no.9: 22-25 S '62. (MIRA 15:8)

1. Rostovskiy sovet narodnogo khozyaystva.
(Farm produce) (Rostov Province--Canning industry)

L 21536-66 EWT(1)/ETC(m)-6 IJP(c) WW
ACC NR: AP6008303 SOURCE CODE: UR/0237/66/000/002/0021/0024

AUTHOR: Ivanov, A. V.; Rozov, S. P.; Firsov, N. T.

37
35
B

ORG: none

TITLE: A vacuum x-ray spectrometer for the 1.5-45 mμ spectral region

SOURCE: Optiko-mekhanicheskaya promyshlennost', no. 2, 1966, 21-24

TOPIC TAGS: spectrometer, x ray spectroscopy, diffraction grating

ABSTRACT: The authors describe the SP-114 diffraction-grating vacuum spectrometer for studying emission and absorption spectra in the 1.5-45 mμ spectral region to determine the energy structure of solids. The optical system of the instrument is based on sliding incidence of the rays on a fixed concave diffraction grating and Rowland circle spectral focusing. A schematic diagram of the instrument is shown in the figure. The input slit 2 and diffraction grating 3 are fastened to a template 1. Receiver 4 with reception slit 5 is mounted on carriage 6 which is moved by lead screw 7 and nut 8 along template 1. The carriage may be moved either manually by handwheel 9 or automatically by drive unit 10. The automatic drive moves

UDC: 535.853.3-3

Card 1/2

L 21536-66
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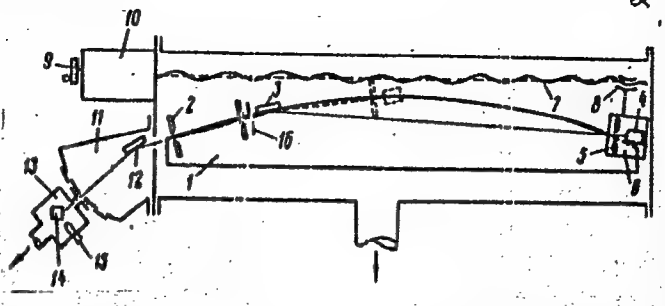


the carriage at rates of 1, 2.5, 5, 10, 25, 50, and 1000 μ/sec. The instrument has working ranges of 1.5-4.5 mμ and 4.5-45 mμ which are set by changing the diffraction grating and template. The width of slits *2* and *5* may be varied from 0 to 0.4 mm without breaking the vacuum in the instrument. Between the input slit and the radiation source is a condenser *11* with replaceable spherical or toric mirrors *12* for focusing the source on the input slit and (in the case of toric mirrors) compensating for astigmatism of the lattice in certain spectral intervals. The condenser mirrors as well as the anode *14* and cathode *15* in the x-ray source *13* may be adjusted without breaking the vacuum in the instrument. The unit has a lock device *16* for placing filters in the beam between the input slit and the lattice. The instrument measures 140 × 130 × 140 cm. "The authors are grateful to A. I. Yefremov for a number of comments and for assistance in developing the instrument and to Academician A. A. Lebedev for directing the work." Orig. art. has: 4 figures. [14]

SUB CODE: 20/ SUBM DATE: 15Apr65/ ORIG REF: 007/ OTH REF: 001
ATD PRESS: 4218
Card 2/2

L 26785-66 EWP(j)/EWT(l)/EWT(m)/ETC(m)-6/T IJP(c) RM/WW/DJ

ACC NR: AP6017452 SOURCE CODE: UR/0237/66/000/002/0021/0024

50
47
B

AUTHOR: Ivanov, A. V.; Rozov, S. P.; Firsov, N. T.

ORG: none

TITLE: Vacuum x-ray spectrometer for the 1.5-45 mμ spectral region

SOURCE: Optiko-mekhanicheskaya promyshlennost', no. 2, 1966, 21-24

TOPIC TAGS: spectrometer, emission spectrum, absorption spectrum/SP-114 spectrometer

ABSTRACT: The authors describe the SP-114 spectrometer for analyzing emission and absorption spectra in the 1.5-45 mμ x-ray region. The device uses the principle of glancing beam incidence on a stationary concave diffraction grading with Rowland circle spectral focusing. A schematic diagram and cutaway view of the instrument are shown. The instrument has spectral working ranges of 1.5-4.5 mμ and 4.5-45 mμ which are selected by changing the diffraction grating and master tamplate. The grating for the shortwave range has a radius of curvature of 6 m, while that for the longwave range has a radium of curvature of 2 m. The width of the input and output slits for the spectrometer may be varied from 0 to 0.4 mm without destroying the vacuum in the instrument. Provision is made for controlling the height of both slits. The condenser mirrors may be adjusted without destroying the vacuum. All the vacuum seals in the instrument are made from metal and teflon so that the device may be

Card 1/2 UDC: 535.853.3-3

L 26785-66

ACC NR: AP6017452

3

heated for degassing. The regulated power supply may be controlled from 0 to 10 kv and plate current is adjustable from 20 μa to 200 ma. An oil-vapor pump is used for evacuating the spectrometer tube to a pressure of $1 \cdot 10^{-5}$ mm Hg, while a second oil-vapor pump evacuates the x-ray tube to a pressure of $1 \cdot 10^{-6}$ mm Hg. The instrument measures 140x130x140 cm overall. Instrumental errors are analyzed. The authors are grateful to A. I. Yefremov for a number of comments and assistance in developing the instrument and to Academician A. A. Lebedev for directing the work. Orig. art. has: 4 figures. [JPRS]

SUB CODE: 20 / SUBM DATE: 15Apr65 / ORIG REF: 007 / OTH REF: 001

Card 2/2 CC

FIRSOV, N.V., kandidat tekhnicheskikh nauk.

Potato harvesting combines and their further development. Sel'khoz-mashina no.5:3-9 My '54. (MLRA 7:5)
(Harvesting machinery) (Potatoes--Harvesting)

FIRSOV, N V

Epp
.R9159

Mashiny dlya vozdelyvaniya kartofelya. Moskva, Mashgiz, 1955.
124 p. illus., diagrs., tables.

FIRSOV, N.V.

Over-all mechanization of potato harvesting. Trakt.i sel'khozmash. no.6:25-28 Je '59. (MIRA 12:9)
(Potatoes--Harvesting)

PETROV, G.D.; kand.tekhn.nauk; FIRSOV, N.V., kand.tekhn.nauk

Harvesting potatoes in a continuous operation. Mekh. i elek. sots. sel'khoz. 19 no.2:10-12 '61. (MIRA 14:3)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut sel'skokhozyaystvennogo mashinostroyeniya.
(Potatoes—Harvesting)

GUDZENKO, I.P.; FIRSOV, N.V.; GORBUNOV, V.R., inzh., retsenzent;
ZHURAVLEVA, M.N., red.izd-va; YEGORKINA, L.I., red. izd-va;
SMIRNOVA, G.V., tekhn. red.

[Machines for raising and harvesting potatoes]Mashiny dlia vozdelyvaniia i uborki kartofelia. Moskva, Mashgiz, 1962. 269 p.
(MIRA 16:3)

(Potato machinery)

PETROV, G.D.; FIRSOV, N.V.

Types of potato diggers. Trakt. i sel'khozmash. 32 no.6:22-26 Je '62. (MIRA 15:6)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut sel'skokhozyaystvennogo mashinostroyeniya.
(Potato digger (Machine))

PETROV, G.D.; FIRSOV, M.V.; KOLCHIN, N.N.; KALAMIN, A.I.; KUCHERENKO, N.Ye.; ANIKEYENKO, A.I.

Mechanization of potato storing and prospects for its development. Trakt. i sel'khozmash. no.7:22-24 Jl '64. (MIRA 18:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut sel'skokhozyaystvennogo mashinostroyeniya, Moskva (for Petrov, Firsov, Kolchin, Kalamin). 2. Nauchno-issledovatel'skiy institut torgovli i obshchestvennogo pitaniya (for Kucherenko). 3. Gosudarstvennyy institut po proyektirovaniyu predpriyatiy torgovli i obshchestvennogo pitaniya (for Anikeyenko).

FIRSOV, N., inzh.

Such screwdrivers are very useful. NTO 3 no.11:17 N '61.
(MIRA 14:10)

1. Zavod "Manometr", chlen Nauchno-tekhnicheskogo obshchestva zavoda.

(Screwdrivers)

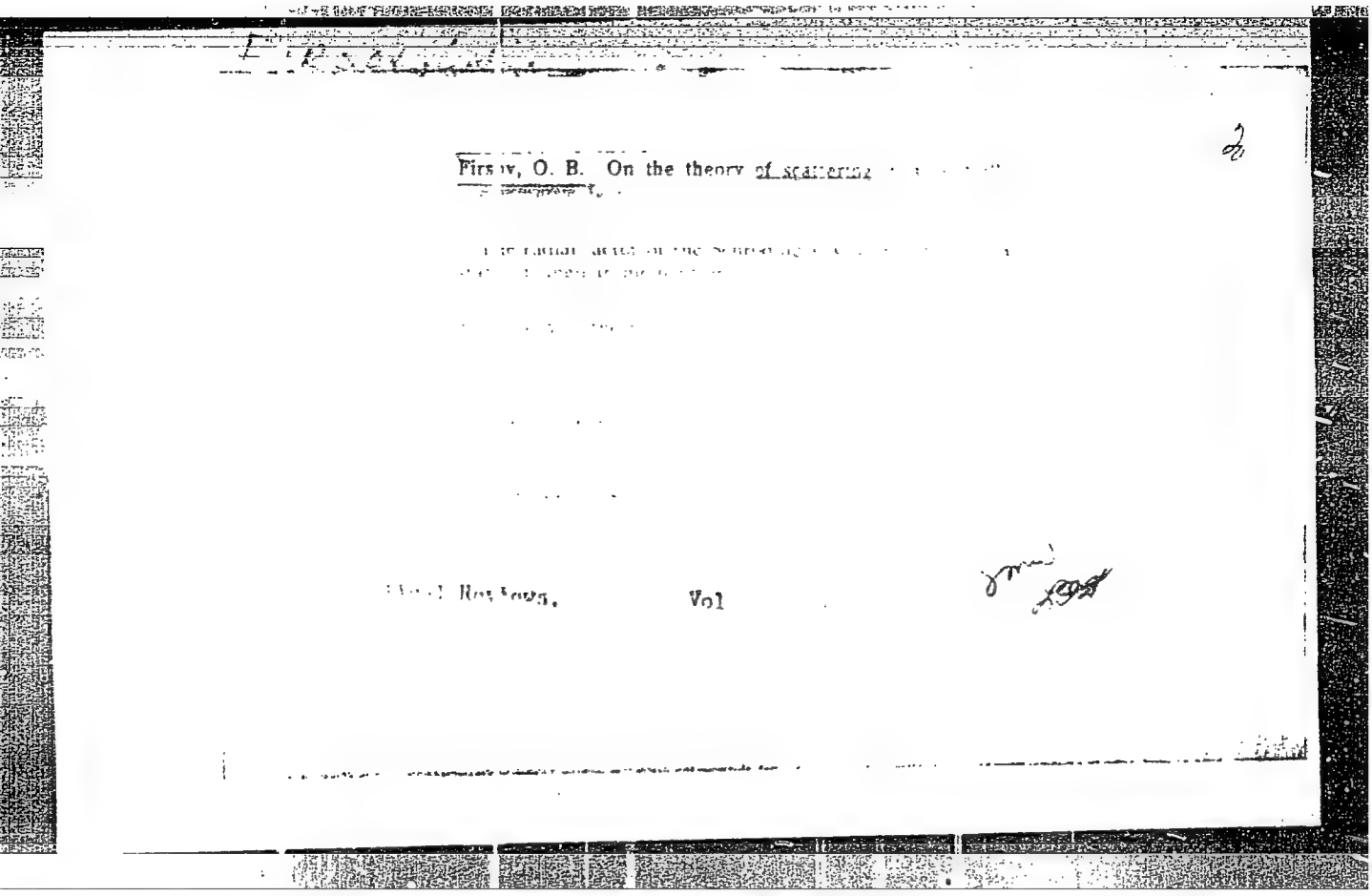
FIRSOV, O., inzhener, laureat Stalinskoy premii.

Operating a multi-cradle side slip. Mor.i rech.flot 13 no.4:16-20 Ag '53.
(MLRA 6:10)
(Shipyards)

FIRSOV, O. B.

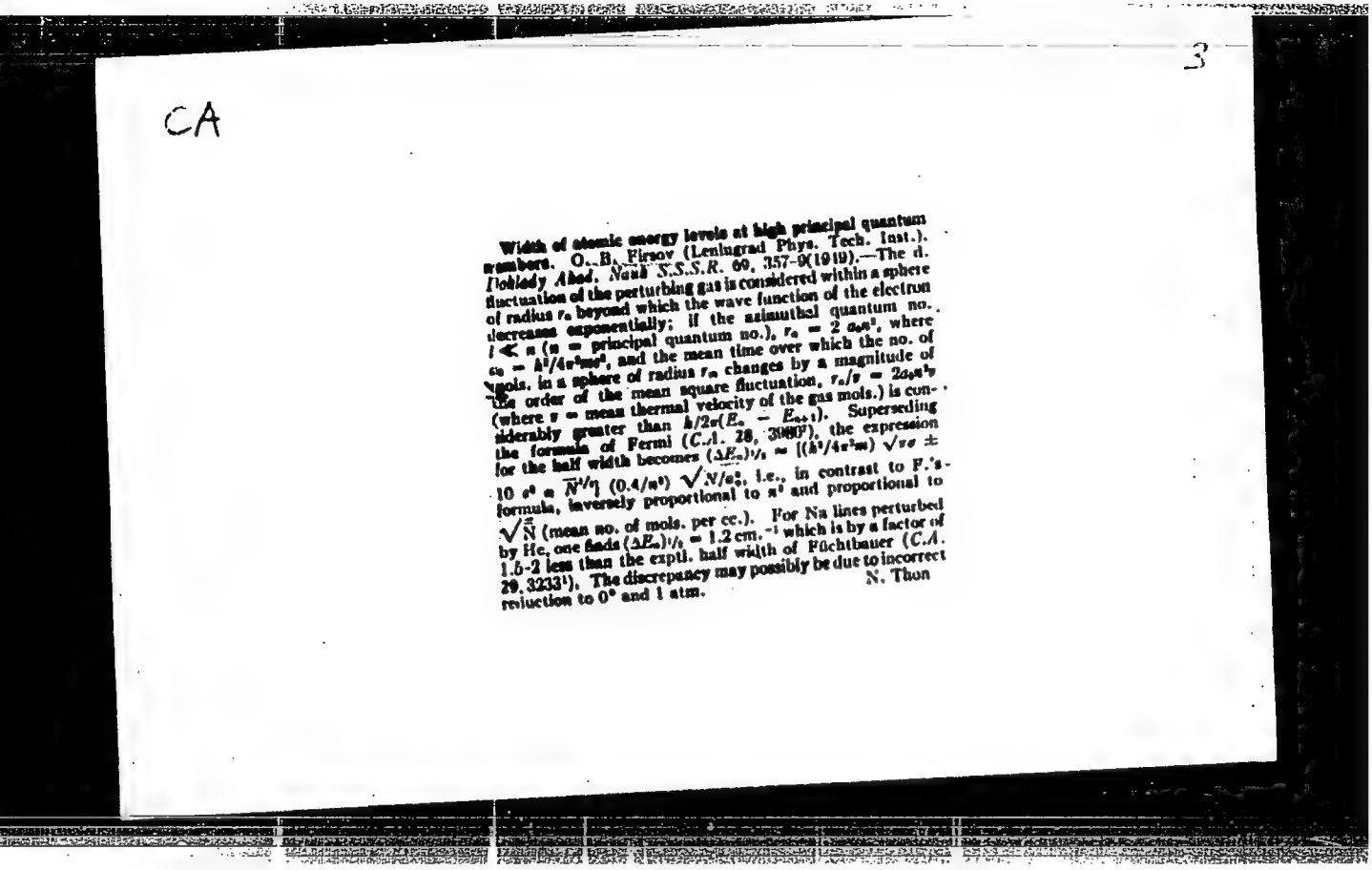
35822. Shirnia urovney energii atoma s bol'shim glavnym kvantovym chislom. Doklady akad. nauk SSSP, novaya seriya. T. LXIX. No. 3, 1943 S. 357-59

SO: Letopis' Zhurnal'nykh Statey, Vol. 39, Moskva, 1949



Firsov, O. B. On the theory of scattering

Vol



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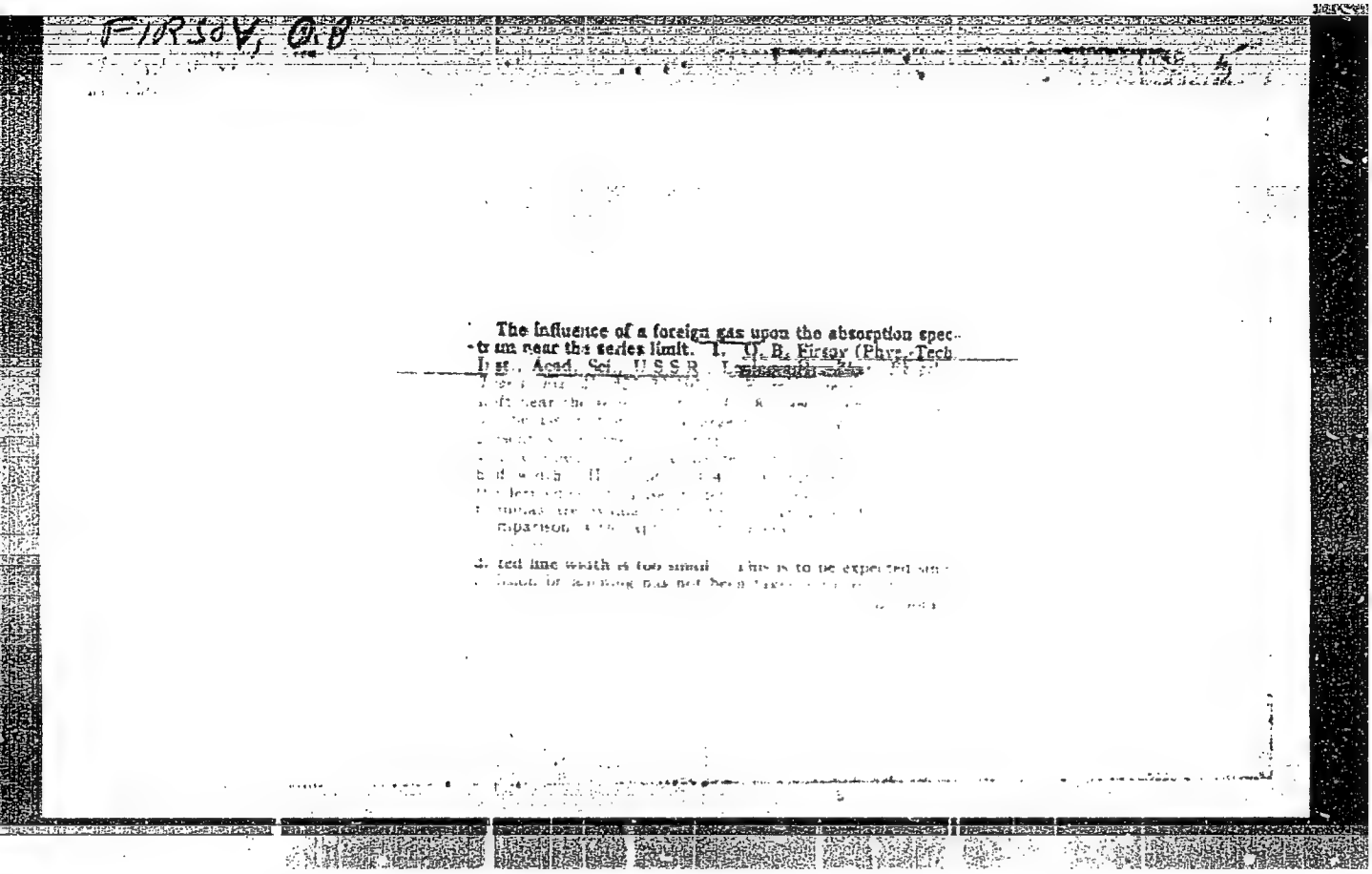
CA

Width of atomic energy levels at high principal quantum numbers. O. B. Firsov (Leningrad Phys. Tech. Inst.). *Doklady Akad. Nauk S.S.S.R.* 69, 357-9(1949).—The d. fluctuation of the perturbing gas in considered within a sphere of radius r_0 beyond which the wave function of the electron decreases exponentially; if the azimuthal quantum no. $l \ll n$ (n = principal quantum no.), $r_0 = 2\,a_0 n^2$, where $a_0 = h^2/4\pi^2 me^2$, and the mean time over which the no. of mols. in a sphere of radius r_0 changes by a magnitude of the order of the mean square fluctuation, $\tau_0/v = 2a_0 n^2/v$ (where v = mean thermal velocity of the gas mols.) is considerably greater than $h/2\pi(E_n - E_{n+1})$. Superseding the formula of Fermi (*C.A.* 28, 3080[1]), the expression for the half width becomes $(\Delta E_n)^{1/2} \sim [(h^2/4\pi^2 m)\sqrt{\pi}\sigma \pm 10\,\sigma^2 \approx \bar{N}^{1/2}\eta\,(0.4/n^2)\sqrt{N}/a_0^3$, i.e., in contrast to F.'s formula, inversely proportional to n^3 and proportional to $\sqrt{\bar{N}}$ (mean no. of mols. per cc.). For Na lines perturbed by He, one finds $(\Delta E_n)^{1/2} = 1.2$ cm.$^{-1}$ which is by a factor of 1.5-2 less than the expti. half width of Füchtbauer (*C.A.* 29, 3233[1]). The discrepancy may possibly be due to incorrect reduction to 0° and 1 atm.

N. Thon



The influence of a foreign gas upon the absorption spec-
trum near the series limit. I. U. B. Firsov (Phys.-Tech.
Inst., Acad. Sci., U.S.S.R.)

FIRSOV, O. B.

183T101

USSR/Physics - Spectrum, Absorption May 51

"Influence of a Foreign Gas on the Absorption Spectrum Close to the Limit of the Series, II," O. B. Firsov, Leningrad Physico Tech Inst, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXI, No 5, pp 634-641

Firsov determines form of spectral line on basis of expression for displacement of spectral line of atom in foreign gas. Uses method of characteristic functions in the derivation. Thermal motion of mols is not taken into consideration,

LC 183T101

USSR/Physics - Spectrum, Absorption (Contd) May 51

and therefore theoretical curves showing dependence of width of the line on main quantum number lie below exptl curves. Submitted 9 Jun 50.

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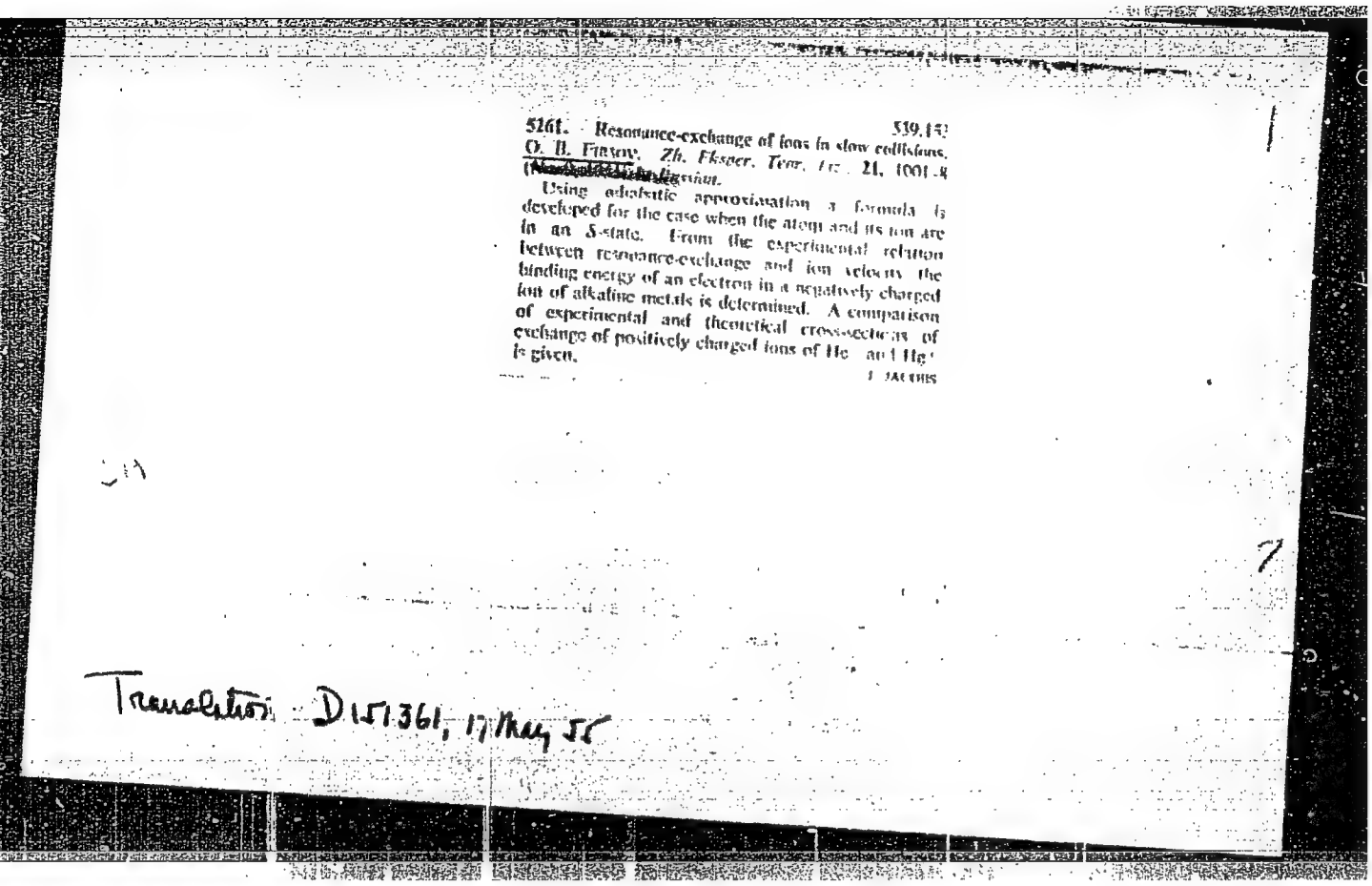
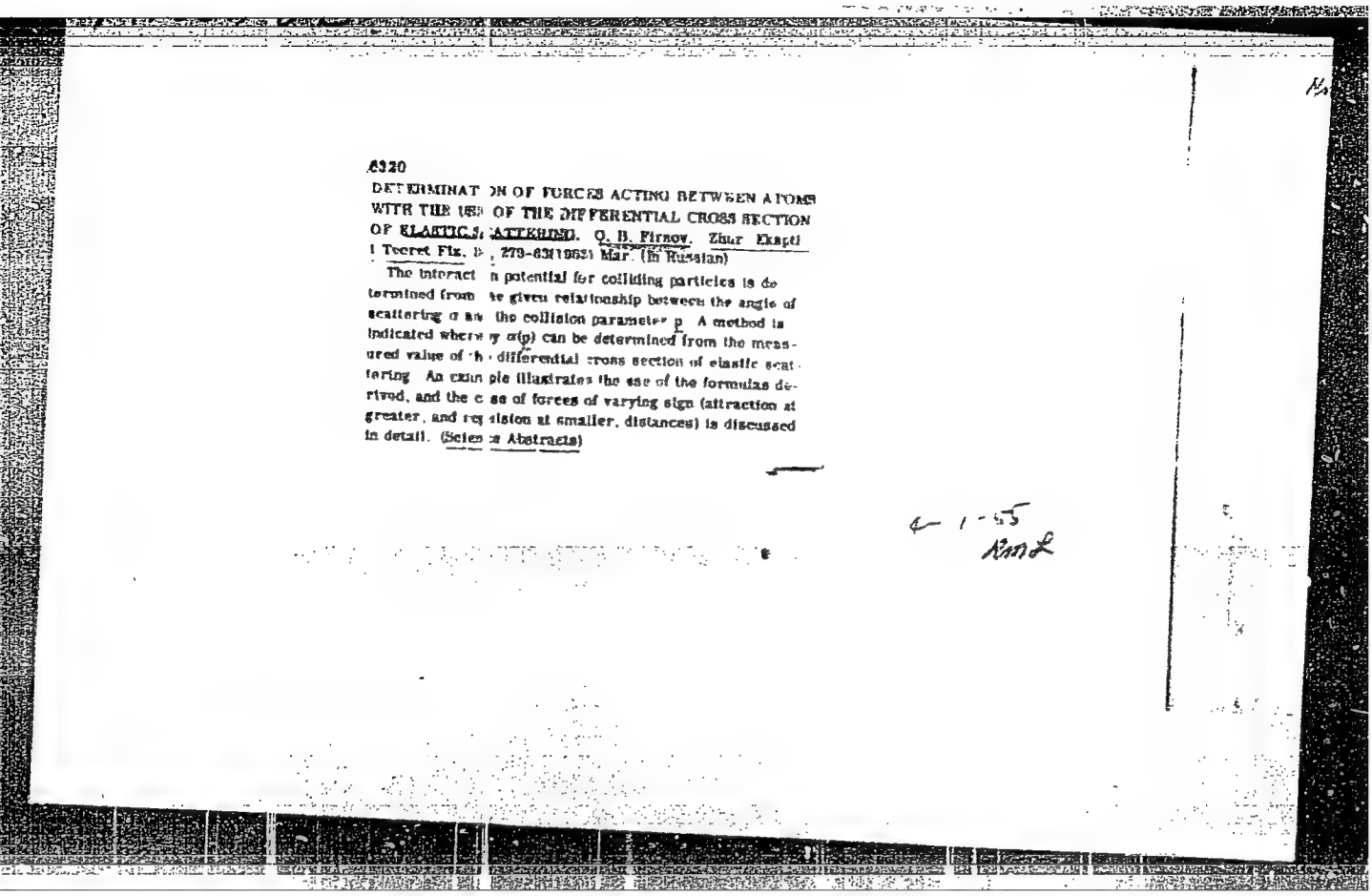


5261. Resonance-exchange of ions in slow collisions. 539.143
O. B. Firsov. *Zh. Eksper. Teor. Fiz.*, 21, 1001–4 (Nov. 1951). In Russian.

Using adiabatic approximation a formula is developed for the case when the atom and its ion are in an *S*-state. From the experimental relation between resonance-exchange and ion velocity the binding energy of an electron in a negatively charged ion of alkaline metals is determined. A comparison of experimental and theoretical cross-sections of exchange of positively charged ions of He and Hg is given.

J. Jacobs

Translation: D-L-1361, 17 May 55



6320

DETERMINAT ON OF FORCES ACTING BETWEEN ATOMS WITH THE HE OF THE DIFFERENTIAL CROSS SECTION OF ELASTIC S ATTERING. O. B. Firsov. Zhur Eksptl i Teoret Fiz, 2 , 279-63(1952) Mar. (In Russian)

The interact n potential for colliding particles is determined from te given relationship between the angle of scattering a as the collision parameter p. A method is indicated where y a(p) can be determined from the measured value of th differential cross section of elastic scattering. An exam ple illustrates the use of the formulas derived, and the c se of forces of varying sign (attraction at greater, and rep ulsion at smaller, distances) is discussed in detail. (Scien e Abstracts)

FIRSOV, O.B.

21 Jul 53

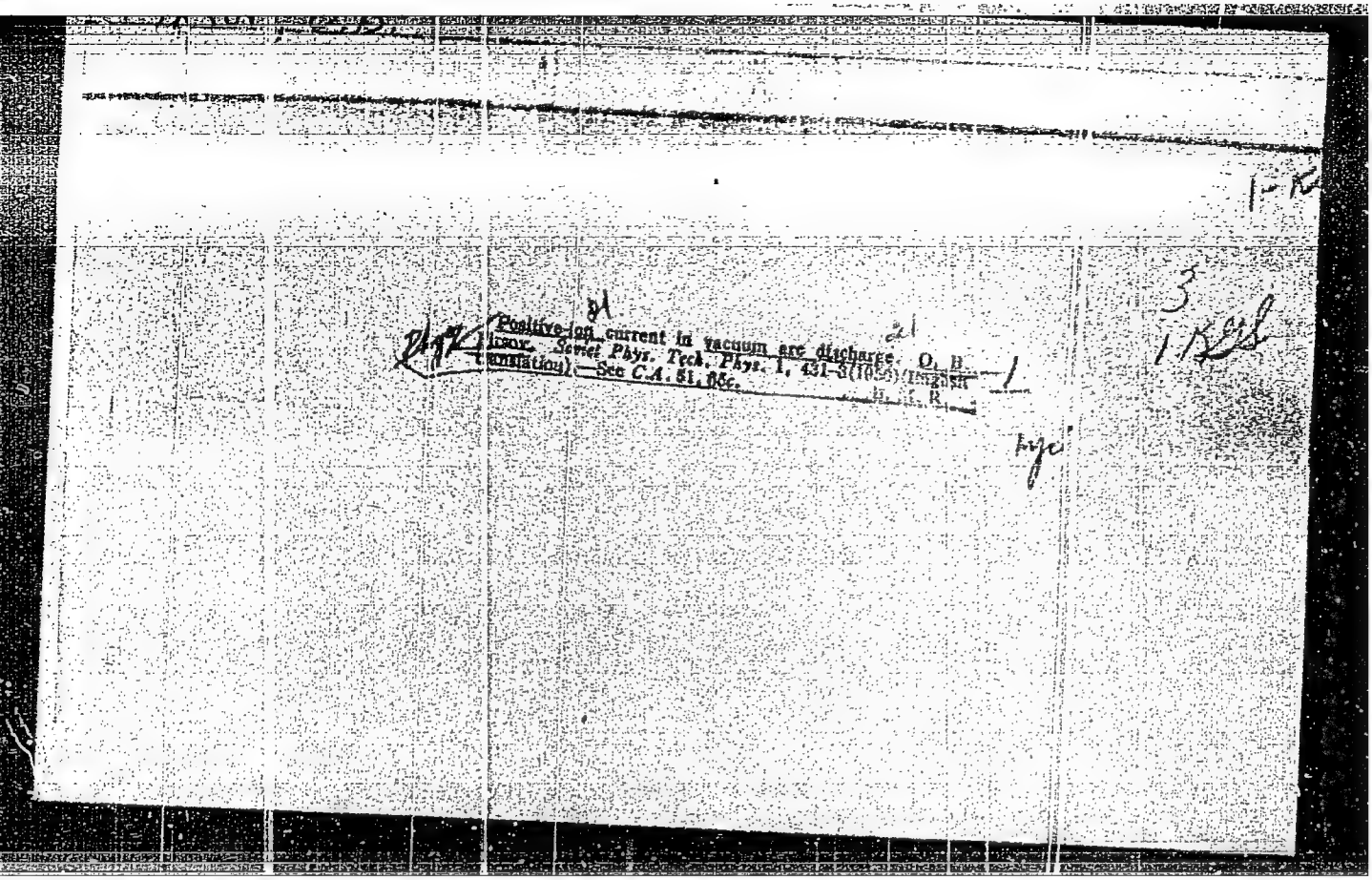
USSR/Nuclear Physics - Atoms, Interaction

"Interaction of Atoms at Distances Below 5×10^{-9} Centimeters," O. B. Firsov, Leningrad Physicotech Inst, Acad Sci USSR

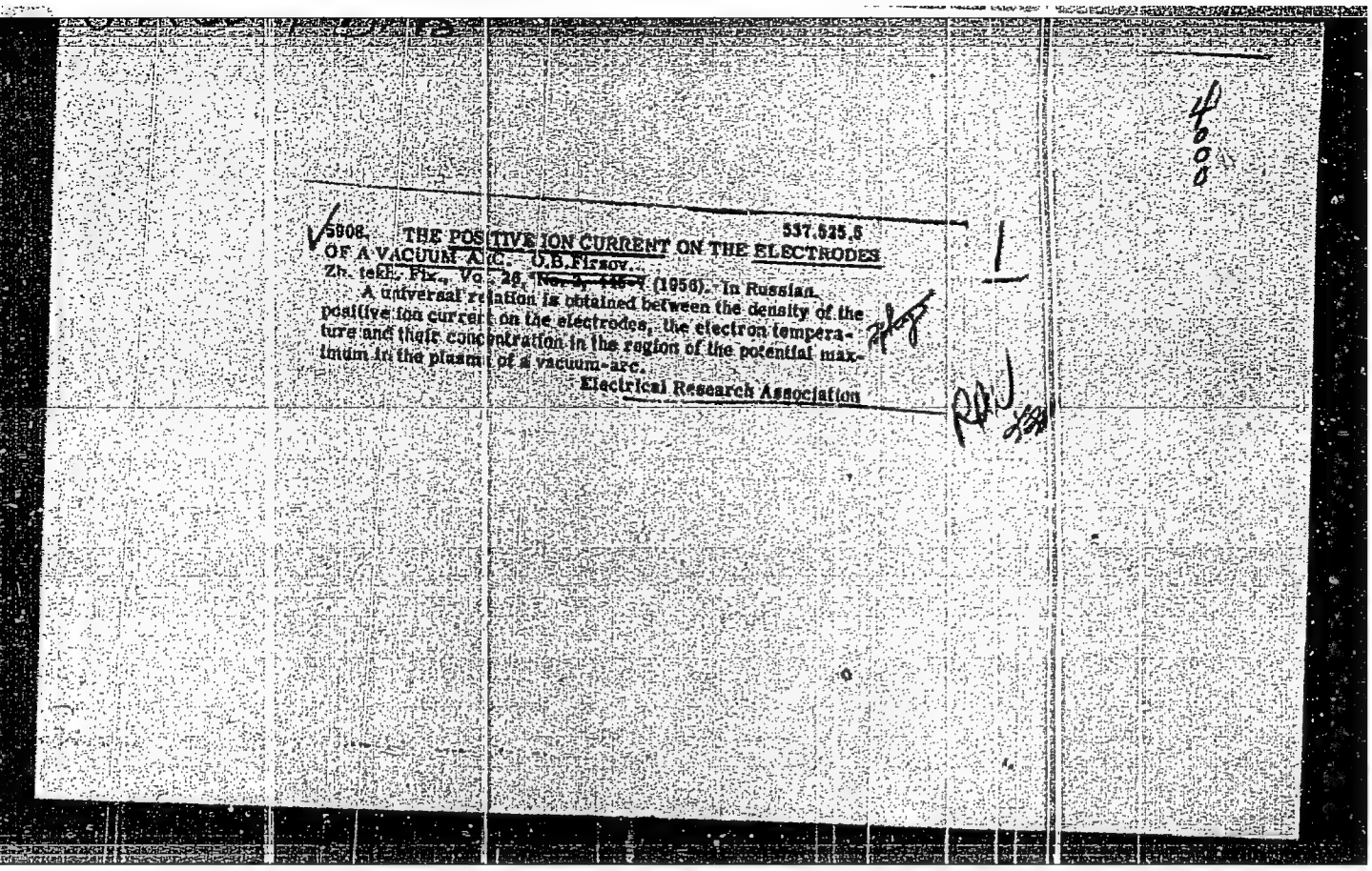
DAN SSSR, Vol 91, No 3, pp 515-518

Derives eqs of motion of atomic nuclei as function of potential energy, and the state of electrons as function of interatomic distance and initial state. Concludes that processes occurring with valent electrons cannot modify interaction of atoms at distances below 10^{-8} cm. Presented by Acad V. A. Fok 30 May 53.

262T71



Positive-ion current in vacuum arc discharge. O. B.
(trans. Soviet Phys. Tech. Phys. 1, 431-3(1956)(English
translation)—See C.A. 51, 86c.



5808. THE POSITIVE ION CURRENT ON THE ELECTRODES OF A VACUUM ARC. 537.525.5

O.B.Firsov.

Zh. tekE. Fiz., Vol. 26, No. 5, 1135-7 (1956). In Russian.

A universal relation is obtained between the density of the positive ion current on the electrodes, the electron temperature and their concentration in the region of the potential maximum in the plasma of a vacuum-arc.

Electrical Research Association

AUTHOR FIRSOV, O.B. 56-6-25/56

TITLE Interaction Energy of Atoms for Small Nuclear Separations. (Energiya vzaimodeystviya atomov pri malykh rasstoyaniyakh mezhdu yadrami -Russian)

PERIODICAL Zhurnal Eksperim. i Teoret.Fiziki,1957,Vol 32,Nr 6,pp 1464-1469 (U.S.S.R.)

ABSTRACT The Minimum Principle: If the separations between the nucleons of the atoms which are in interaction, are less than 10^{-8} cm, the interaction of the exterior parts of the electron shells of the atom makes only a small contribution to the interaction energy of the atoms (compared with the modification of the energies of the interior parts of the electron shell). For the inner parts of the electron shell the conceptions introduced by Thomas-Fermi can be applied. The density ϱ can be determined from the minimum condition for H. Also the Thomas-Fermi-equation for any number of nuclei is derived. The maximum principle: Here a functional of a certain function of the coordingtes is set up, the highest value of which is equal to the same energy of the electrons. The next chapter deals with the physical significance of the maximum principle and the maximum variation principle.With the help of these two principles the upper and the lower limit of H_o can be determ ined. Near the extremum the functional is only little sensitive to small modifications of its argument - function. Therefore, ϱ can be varied within the domain of a more or less well selected class of functions and the appro-

Card 1/2

Interaction Energy of Atoms for Small Nuclear Separations.

ximated value of H_o can be determined in this manner. 56-6-25/56
The last chapter deals with the two center problem. Here also the upper limit of the error is evaluated on the occasion of the determination of the energy of the electrons.
(1 table).

ASSOCIATION Not Given.
PRESENTED BY
SUBMITTED 24.9.1956
AVAILABLE Library of Congress.
Card 2/2

FIRSOV, O. B.

AUTHOR: Firsov, O.B. 56-3-21/59

TITLE: Calculation of the Interaction Potential of Atoms. (Vychisleniye potentsiala vzaimodeystviya atomov)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3, pp. 696-699 (USSR)

ABSTRACT: The interaction potential of atoms is represented as sum of the Coulomg interaction of atomic nuclei and the change of electronic energy in approaching the nucleus. A change of electronic energy is theoretically calculated by means of statistical models taking into account the Thomas-Fermi screening function. The fact that the screening function can be approximately represented as function of an argument makes it possible to immediately calculate within certain areas the differential affective scattering cross-section for any pair of colliding atoms. There are 1 figure and 3 Slavic references.

SUBMITTED: March 5, 1957.

AVAILABLE: Library of Congress

Card 1/1

FIRSOV, O. B.

"The Repulsion of charged Particles from Regions of Strong Magnetic Fields." (Work carried out in 1956); pp. 259-267.

"Plasma in Magnetic Net." (Work Carried out in 1957); pp. 327-335.

"The Physics of Plasmas; Problems of Controlled Thermonuclear Reactions." VOL. III. 1958, published by Inst. Atomic Energy, Acad. Sci. USSR.
resp. ed. M. A. Leontovich, editorial work V. I. Kogan.

Available in Library.

AUTHOR: Firsov, O. B. 56-2-23/51

TITLE: The Scattering of Ions on Atoms (Rasseyaniye ionov na atomakh)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol 34, Nr 2, pp 447-452 (USSR)

ABSTRACT: By means of the potential of interaction between atoms, earlier defined by the author on the basis of the statistical theory of Thomas-Fermi, the author computes the target parameter (prizel'nyy parametr) as a function of the relative motion and of the angle of scattering. Furthermore the diffusion cross section of the scattering in atomic collisions is calculated. Only such collisions are investigated the energies of which considerably exceed the ionization potential of the atoms (~1keV and more). The first chapter deals with the dimensionless energy as well as with the target parameter. First a formula for the interaction potential of the electrons, calculated on the basis of the statistical model for electrons, is given. This formula has a degree of accuracy of about 10%. The solution of an

Card 1/2

The Scattering of Ions on Atoms

56-2-23/51

equation given here makes possible the determination of the differential cross section of scattering for any pair of colliding atoms (or of an atom and a single-charged ion). Condition is that the ionization of the one atom before the collision is not important. The next chapter deals with the diffusion cross section. The results of the calculations are mentioned in a table, and formulae of good approximation are given. Furthermore the diffusion cross section of the total scattering was calculated and a formula of good approximation for the result found on this occasion is given. The calculated values of the target parameter correspond approximatively to the interaction potential $\sim 1/r^2$. The experimental values, however, for the scattering angle $\alpha > 6^0$ rather correspond to the Coulomb law with $Z_1 Z_2 = 1:4$. (This value was calculated for $\alpha = 10^0$). In agreement with the experiment the scattering therefore occurs in such a way as if in the beginning of the interaction all exterior shells with both colliding atoms would collide strongly or at least would strongly inflate. On this occasion the inner (neon-) shells remain undamaged here. There are 1 table and 5 references, all of which are Slavic.

Card 2/3

FIRSOV, O.B., Doc Phys Math Sci — (diss) "Calculations of the collision of ions with atoms." Mos, 1959, 26 pp (Order of Lenin Inst of Atomic Energy of Acad Sci USSR) 101 copies. Mimeographed (KL, 34-59, 110)

Firsov, O.B.

66702

24,2120

SOV/109-4-8-22/35

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

ABSTRACT: The conference was organised by the Ac.Sc.USSR, the Ministry of Higher Education and Moscow State University. It was opened by the chairman of the organising committee, M.A. Leontovich, Academician. During the plenary sessions of the conference, a number of survey papers were delivered. L.A. Artsimovich read a paper on "Production of Ultra-high Temperatures in Plasma".
A survey of the optical method of measurements was given in the papers by V.A. Fabrikant and S.E. Frish.
S. Brown of the Massachusetts Institute of Technology gave a survey of the high-frequency methods of the investigation of stationary and non-stationary plasma (see p 1344 in this issue of the journal).
N.V. Fedorenko read a paper entitled "Ionisation and Inelastic Scattering During Atomic Collisions".

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L.A. Sena and Yu.M. Kagan deal with "Elementary Processes of Determining the Motion of Ions in Gas".
A paper by Ye. Bedereu (Rumania) dealt with "The Role of Resonance-recharging in the Kinetics of Ions".
I.S. Stekol'nikov considered the initial stages of the development of sparks (corona-leader, main channel and the final channel).
B.N. Klyarfel'd gave a survey of the ignition processes of the discharges in highly rarified gases.
The mechanism of the breakdown of a high-vacuum gap was elucidated in a paper by V.L. Granovskiy.
L. Tonks (USA) expounded a theory of the motion of electrons in a magnetic trap (see p 1316 of this journal).
Academician R. Rompe (Eastern Germany) described a number of experiments on non-stationary plasma conducted by himself.
M. Steenbeck (Eastern Germany) gave a generalised theory of plasma. The conference was divided into six sections.
The first section was presided over by L.A. Sena and was concerned with the elementary processes in gas discharges.
The following papers were read in this section:
Ya.M. Fogel' - "Transformation of Positive Ions Into Negative Ones in Rarified Gases".
Ya. M. Fogel' with V.A. Ankudinov and D.V. Pilipenko - "Capture and Loss of Electrons During the Collision of Fast Atoms of Carbon and Hydrogen with the Molecules of Gases".
N.V. Fedorenko et al. - "Dissociation of Molecular Ions of Hydrogen During Collisions in Gas".
I.P. Flaks and Ye.S. Solov'yev - "Capture Cross-sections of Electrons in Multicharge Ions in Inert Gases".
R.M. Kushnir et al. - "Experimental Investigation of the Resonance Recharging in Certain Single-atom Gases and Metal Vapours".
O.B. Firsov - "Qualitative Investigation of Inelastic Collisions of Atoms".
L.M. Volkova - "Effective Excitation Cross-sections of the Spectral Lines of Potassium and Argon".

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I.P. Zapesochnyy and S.N. Kishko "Some Results of the Investigation of the Optical Functions of the Excitation Bands of a Negative System".
A.A. Vorob'yev and A.G. Vlasov - "Investigation of the Scattering of the Electrons in a Betatron Chamber".
The second section was presided over by B.N. Klyarfel'd and was devoted to the problems of the electrical breakdown in rarified gases and in high vacuum. The following papers were read in this section:
G.Ye. Makar-Limanov and Yu.A. Metlitskiy - "Electrostatic Control of the Ignition of Glow-discharge Tubes" (see p 1274 of the journal).
E.V. Ptitsyn et al. were concerned with the breakdown in a high-voltage mercury rectifier (see p 1278 of the journal).
L.G. Guseva "Ignition of the Discharge in Non-uniform Fields at Low Gas Pressures" (see p 1260 of the journal).
A.S. Soboleva and B.N. Klyarfel'd - "The Discharge Phenomena Between a Point and a Plane at Gas Pressures of 10^{-3} - 1 mm Hg".

21(7), 24(5)

AUTHOR: Firsov, O. B.

SOV/56-36-5-34/76

TITLE: A Qualitative Interpretation of the Mean Excitation Energy of Electrons in Collisions Between Atoms (Kachestvennaya traktovka sredney energii vozbuzhdeniya elektronov pri atomnykh stolknoveniyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 5, pp 1517-1523 (USSR)

ABSTRACT: It is assumed that the transformation of the kinetic energy of the relative motion of the two colliding particles into electron excitation energy is the result of a deceleration caused by electron exchange. Electron motion in the region of overlapping of the shells of the colliding particles is investigated in quasiclassical approximation. It is further assumed that an electron changing over from the potential field of one atom into that of another transfers from the first to the second a momentum, the average value of which is proportional to the product of the relative velocity of the atom and the electron mass. The criterion for the applicability of the author's calculation method consists in the fact that the distances between the adjacent energy levels of the systems of the colliding atoms are small compared to the

average excitation energy of the electrons, which most probably renders the applicability of the first approximation of any perturbation theory impossible. For electron excitation energy one proceeds from the following ansatz:

$\xi = m\iint\left(\int_S \frac{n\,v}{4}\,dS\right)\vec{R}d\vec{R}$ ($R = |\vec{R}_a - \vec{R}_b|$, the distance between the nuclei, $\vec{R}$ denotes their relative velocity). By means of the substitutions $\vec{R}d\vec{R} = udx$, $u = |\dot{\vec{R}}|$, $dx = \vec{R}d\vec{R}/|\dot{\vec{R}}|$, the formula goes over to $\xi = \frac{h\,u}{4\pi^2 a_0}\int\left(\int_S \varphi^2\,dS\right)dx$. The final formula, if the S-surface is assumed to be plane, is

$$\xi = \frac{(Z_a + Z_b)^{5/3}\,4.3.10^{-8}\,u}{\left[1+0.16(Z_a+Z_b)^{1/3}10^7 R_0\right]^5}\ [ev]$$

(u in [cm/sec] and R_0 in [cm])

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A Qualitative Interpretation of the Mean Excitation Energy of Electrons in Collisions Between Atoms SOV/56-36-5-34/76

Direct measurements are available only for collisions of the ions Ar^+ and Ne^+ at 75 kev with Ar-atoms (V. V. Afrosimov and N. V. Fedorenko), (Ref 2). A comparison between the theoretical calculations and measurements shows only very unsatisfactory agreement; the experimental ξ-values are considerably higher. This fact is discussed in detail. The author thanks the participants in the joint seminars of experimenters and theoreticians of the Leningradskiy fiziko-tekhnicheskiy institut (Leningrad Physico-technical Institute), especially N. V. Fedorenko, V. M. Dukel'skiy, L. E. Gurevich, I. M. Shmushkevich, G. F. Drukarev, B. T. Geylikman, D. M. Kaminker, V. V. Afrosimov, N. M. Poliyektov-Nikoladze and V. I. Kogan for discussions. There are 7 references, 5 of which are Soviet.

SUBMITTED: November 25, 1958

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24 (5), 24 (7)

AUTHORS: Fetisov, I. K., Firsov, O. B. SOV/56-37-1-14/64

TITLE: The Resonance Charge Exchange of Doubly Charged Ions in Slow Collisions (Rezonansnaya perezaryadka dvukhzaryadnykh ionov pri medlennykh stolknoveniyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 1(7), pp 95 - 97 (USSR)

ABSTRACT: The authors of the present paper calculate the cross section of the resonance charge exchange of doubly charged ions in adiabatic approximation, and then they compare the experimental and theoretical cross sections of the charge exchange of doubly charged positive ions of A, Kr, Xe, Ne. This problem is reduced to the calculation of the separation of the electron levels in the approximation of nuclei. The authors presuppose that with not very small distances between the atomic nuclei, the difference $E_a - E_c$ can be calculated by substituting $\psi_{c,a} \sim [\varphi_A(r_1,r_2) \pm \varphi_B(s_1,s_2)]/\sqrt{2}$ for He^{++}. E_a and E_c denote the energy level of electrons corresponding to the antisymmetric and symmetric wave functions, respectively. φ_A and φ_B denote the

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wave functions, belonging to helium, of electrons in the ground state if the electrons belong to nucleus A and B, respectively. Formulas for the energy of the electrons are given in first approximation. Most simple helium functions of the type $C \exp\left[-\alpha(r_1 + r_2)\right]$, $\alpha = a_0^{-1}\sqrt{(E_1 + E_2)/2E_0}$ were used as functions φ. $E_1 + E_2$ denote the total energy of the electrons of the atom, E_0 the energy of the electron in the hydrogen atom, a_0 the Bohr radius. The theory discussed in the present paper is suitable for the relative velocities defined by the inequality $v \ll (\alpha e^2/\hbar)a_0$. The results of calculations are illustrated in a diagram. The relative velocity of motion of the nuclei is plotted on the axis of abscissas, $\alpha^2\sigma$ on the axis of ordinates, σ denoting the cross section of the charge exchange of two electrons. The curve contained in this diagram falls almost linearly downward to the right, only in its initial range it is a little concave upward. The same diagram contains the experimentally measured cross

sections of the two-electron charge exchange of the rare gases A, Ne, Kr, Xe. As the one-electron charge exchange proceeds in the same degree by means of the two-electron charge exchange and by means of elastic scattering (which was not considered in the calculation of the cross section), the theoretical curve rather corresponds to the sum $\sigma_{20} + (1/2)\sigma_{21}$, σ_{20} denoting the cross section of the two-electron charge exchange, and σ_{21} the cross section of the one-electron charge exchange. In the second diagram, the experimental results for the case just mentioned are compared with theory. In the authors' opinion, the results found here agree better with the experiment than those found by Gurnee and Magee (Ref 9). There are 2 figures and 11 references, 3 of which are Soviet.

SUBMITTED: December 29, 1958

83193
S/056/60/039/002/030/044
B006/B056

24.6600

AUTHORS: Mordvinov, Yu. P., Firsov, O. B.

TITLE: The Inelastic Collision Cross Sections for Atoms and Ions as Dependent on Their Velocities in the Case of Pseudo-intersection of the Levels

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 2(8), pp. 427-431

TEXT: The present paper gives a theoretical investigation of the inelastic collision cross sections for atoms and ions as dependent on their velocities in the case of pseudo-intersection of the levels of the system of colliding particles. Here, it is assumed that the nuclei of the colliding particles move in the classical sense rectilinearly and uniformly, and that $v \ll e^2/\hbar$. The eigenvalues of the electron-energy functions E_n are functions of the nuclear coordinates R, and the curves $E_n(R)$ and $E_{n'}(R)$ may, in general, intersect . ($R = |\vec{R}_a - \vec{R}_b|$, $\dot{\vec{R}} = \vec{v}$). If $E_n = E_{n'}$ does not

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change the sign, when passing through the point $R = R_0$, the behavior of $E_n(R)$ and $E_{n'}(R)$ is described as pseudo-intersection of the levels. In the case of low-velocity collisions, (n,n') transitions occur practically only near intersection- or pseudo-intersection points of the levels E_n and $E_{n'}$. L. D. Landau and C. Zener (Refs. 1, 2) developed a theory of these transitions, which, however, the authors of the present paper consider to be incomplete. They show in the present paper that the cross section of such transitions as a function of the velocity v generally has two peaks. For slow inelastic collisions in the case of pseudo-intersection of the levels, only the transition between the two terms near the intersection point ($R = R_0$) need be taken into account. The time dependence of the electron wave functions is taken into account in terms of the radius vectors of the nuclei. The perturbation matrix element in the Landau - Zener formula includes both the ordinary steady separation of the levels and a term that takes the time dependence of the electron wave

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The Inelastic Collision Cross Sections for Atoms and Ions as Dependent on Their Velocities in the Case of Pseudo-intersection of the Levels

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B006/B056

functions into account. Figs. 1 and 2 show $\sigma/\pi R_0^2 = f(v/v_0)$ for special cases. The conditions as to when the curves have two peaks, as well as some problems connected with the relative and absolute position of the peaks are discussed. Ye. M. Lifshits is mentioned. There are 2 figures and 4 references: 2 Soviet and 2 British.

SUBMITTED: March 17, 1960

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88458

S/056/60/039/006/050/063
B006/B063

26.2357

AUTHORS: Firsov, O. B., Chibisov, M. I.

TITLE: Bremsstrahlung of Slow Electrons Interacting With Neutral Atoms

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 6(12), pp. 1770-1776

TEXT: A theoretical study has been made of bremsstrahlung arising from the collision of slow electrons ($E_e < 3$ ev) with neutral atoms. Above all, it is shown that the bremsstrahlung cross section may be represented as a function of the elastic scattering cross section of electrons by atoms. The absorption coefficient of bremsstrahlung has been calculated as well. In the introduction, the most important formulas are presented, including an expression for the intensity of radiation emitted by the electron-atom system:

$$S = \frac{4e^2}{3c^3}\nu^4 \left| \int \varrho_{ab} \vec{r}_o d\vec{r}_o \right|^2 = \frac{4Z^2e^6}{3m^2c^3} \left| \int \varrho_{ab} \frac{\vec{r}_o d\vec{r}_o}{r_o^3} \right|^2$$

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Bremsstrahlung of Slow Electrons Interacting With Neutral Atoms

$\varrho_{ab}(\vec{r}_o) = (Z+1)\int \sum \psi_b^* \psi_a d\tau_1 \ldots d\tau_z \vec{r}_o$ is the radius vector of the inciding electron. This formula holds for the case where the system passes from state a to state b, and may be used to calculate the matrix element of the dipole moment which is determined by the behavior of ϱ_{ab} inside the atom. The calculation of this matrix element requires an exact solution of the Schrödinger equation with the potential

$$U = -\sum_{i=o}^{Z} \frac{Ze^2}{|\vec{r}_i|} + \frac{1}{2} \sum_{i=o}^{Z} \sum_{k=o}^{Z} \frac{e^2}{|\vec{r}_i - \vec{r}_k|}.$$

It has been shown that, at least in the classical theory, the radiation is emitted chiefly from the atom when the electron is at distances in the order of atomic dimensions. In first approximation, the disturbance of the atom by a slow electron manifests itself in the polarization of the atom. If the period of natural oscillations of the atomic dipole ($\sim 10^{-16}$ sec) is very small compared to the time of flight of the electron through the atom ($v_e < 10^8$ cm/sec) the dipole undergoes an adiabatic

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Bremsstrahlung of Slow Electrons Interacting With Neutral Atoms

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variation and $\vec{d} = \alpha\vec{E} = \alpha e\vec{r}/r^3$, where α is the polarization coefficient, and $\vec{r}$ is the radius vector of the incident electron in the nuclear system. For central collisions, $\vec{d} = \alpha e/r^2$ and $\ddot{\vec{d}} = -2e\alpha\dot{r}/r^3 + 6\alpha e\dot{r}^2/r^4$. In addition, $\left|\ddot{d}/e\ddot{d}\right|_{r=r_{min}} = (4\varepsilon_0/e^2)r_{min}$, where $r_{min} \sim 3.10^{-8}$ cm is the value at which $-\ddot{d}/e\ddot{r}$ passes through a minimum. Hence, classical approximation shows that, if r is in the order of some atomic radii, the radiation is emitted primarily from the atomic dipole. Peripheral collisions lead to similar results. Next, the calculation of $\langle\vec{r}\rangle_{ab}$ is discussed, and several relations are derived. The intensity of radiation occurring in a gas composed of neutral atoms and electrons is studied, and the following relations are obtained for the absorption coefficient $a(\nu,k_b)$ or $a(\hbar\nu,E)$ which are defined as the probability that an energy of the frequency ν is absorbed by one electron (per cm^3 gas, per sec): $a(\nu,k_b) = \frac{\hbar k_a^2}{mk_b} n_{at} \frac{\pi^2c^3}{\nu^2}\frac{d\sigma}{d\nu}$ and $a(\hbar\nu,E) = 5.8\frac{e^2\sigma_p(0)}{m}\left(\frac{\hbar\nu}{mc}\right)n_{at}\left(\frac{m}{E}\right)^{3/2}$

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Bremsstrahlung of Slow Electrons Interacting With Neutral Atoms

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$\frac{\sqrt{1 + \hbar\nu/E}\ (2 + \hbar\nu/E)}{(\hbar\nu/E)^3}$. Finally, the results obtained here are compared with the radiation occurring on ions, and it is found that at temperatures below $(7-8)\cdot 10^3$ °K between 10^{-5} - 10^{3} mm Hg, the radiation of a gas is determined by the collisions between electrons and atoms. L. M. Biberman, V. Romanov, I. M. Shmushkevich, and V. Babikov are mentioned. There are 1 figure and 6 references: 4 Soviet, 1 US, and 1 German.

SUBMITTED: July 20, 1960

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1

S/056/62/042/005/026/050
B102/B104

AUTHOR: Firsov, O. B.

TITLE: Kinetics of exothermal reactions between molecules and molecular ions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1307-1310

TEXT: The molecular reaction $A^+ + B \longrightarrow C^+ + D$ is studied theoretically. It can be shown that this reaction occurs by way of a long-lived compound molecule $(AB)^+ = (CD)^+$ provided the kinetic energy of A^+ and B does not exceed 0.1 ev. Assuming equidistribution, the probability of decay $(AB)^+ \longrightarrow A^+ + B$ or $(AB)^+ \longrightarrow C^+ + D$ depends solely on the total energy of the system and the absolute value of the angular momentum, not on whether the primary state was $A^+ + B$ or $C^+ + D$. This hypothesis also applies when the reaction is coupled with an electron exchange as long as the average decay time $(AB)^+ \longrightarrow A^+ + B$ exceeds the average time of electron transfer. It then follows:

$$\overline{\sigma_{12}v_1}\Delta\Gamma_1 = \overline{\sigma_1 v_1}\,\overline{\omega}\Delta\Gamma_1 = \overline{\sigma_2 v_2}(1-\omega)\Delta\Gamma_2 = \overline{\sigma_{21}v_2}\Delta\Gamma_2. \qquad (5)$$

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where $\bar{w}$ is the probability of decay $(AB)^+ \rightarrow C^+ + D$ due to the total angular momentum, σ_i are the collision cross sections, v_i the relative velocities and $\Delta\Gamma_i$ the phase volumes: $\Delta\Gamma_1 \leqslant \Delta\Gamma_2$. The kinetics of the observed reaction are given by the $\overline{\sigma_1 v_1}\bar{w} = \overline{\sigma_1 v_1}/(1+\beta) \approx \sigma_1 v_1$. Here $w = 1/(1+\beta)$ and $\beta = \sqrt{\alpha_1 m_2/\alpha_2 m_1}\,\Delta\Gamma_1/\Delta\Gamma_2$ whilst α_i is the molecular polarizability in atomic units, and m_i are the masses. The cross section for $(AB)^+$ formation due to polarization is of the order of 10^{-15}-10^{-14} cm^2. The decay probability $(AB)^+ \rightarrow C^+ + D$ is close to unity provided that the compound state is independent of whether the original molecules were A^+, B or C^+, D. It is reasonable to assume this. The foregoing results are used for examining the reaction $H_2^+ + H_2 \rightarrow H_3^+ + H + 1.1$ ev. Assuming $\alpha = \alpha_1 = 5.4$ (for H_2) and $\alpha = \alpha_2 = 4.5$ (for H), and that no degrees of vibrational freedom are excited in the molecules the following expression is obtained (with temperature ~ 0.05 ev, total energy $\epsilon_1 = 3.5T \approx 0.2$ ev):

$$\overline{v_1\sigma_{12}} \approx \sigma_1 v_1 = \sqrt{\alpha_1/\mu_1}\cdot 0{,}92\cdot 10^{-9}\ см^3/сек = 2{,}1\cdot 10^{-9}\ см^3/сек.$$

SUBMITTED: December 11, 1961
Card 2/2

45372

S/056/63/044/001/038/067
B102/B186

24.6600
24,3120

AUTHORS: Martynenko, Yu. V., Firsov, O. B., Chibisov, M. I.

TITLE: Slow-electron scattering from atoms

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 1, 1963, 225 - 229

TEXT: The energy dependence of the total scattering cross section for electrons of $E \lesssim 1$ ev is calculated for the case of a dipole field of the scatterer atom. The interaction potential is assumed to be of the form $U = -\alpha e^2 a^3/2r^4$, where α is the polarizability and a Bohr's radius. On introducing $\varphi(r) = rR(r)$, where $R(r)$ is the radial part of the wave function with $l = 0$, and $x = r\alpha^{-1/4}(k/a)^{1/2}$, and $\beta^2 = ka\sqrt{\alpha}$ one obtains a Schrödinger equation of the form $\varphi'' + \beta^2(1+1/x^4)\varphi = 0$; (3). For $x \gg 1$, $\varphi = A \sin(\beta x + \delta_0)$ where δ_0 is the zero scattering phase. Higher phases are neglected. (3) is invariant with respect to the substitutions $x = 1/\xi$ and $\varphi = \psi/\xi$. Then for $x \ll 1$ and $\xi \gg 1$ one obtains $\psi = B \sin(\beta\xi + \gamma)$ and $\varphi = Bx \sin(\beta/x + \gamma)$ and

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the solution of (3) is obtained as

$$x < 1$$
$$\varphi = Bx\left[\sin\left(\frac{\beta}{x}+\gamma\right)+\beta\int_{1/x}^{\infty}\sin\beta\left(\frac{1}{x}-\xi\right)\sin\left(\beta\xi+\gamma\right)\frac{d\xi}{\xi^2}\right], \quad (5)$$

$$x > 1$$
$$\varphi = A\left[\sin\left(\beta x+\delta_0\right)+\beta\int_{x}^{\infty}\sin\beta\left(x-x'\right)\sin\left(\beta x'+\delta_0\right)\frac{dx'}{x'^2}\right]. \quad (6)$$

where β^2/x^4 is considered as a perturbation. After some transformations one obtains

$$\operatorname{tg}\delta_0 = [A(\beta)+\operatorname{tg}\gamma]/[B(\beta)\operatorname{tg}\gamma-1]. \quad (7)$$

β =	0,2	0,4	0,6	0,8	1	1,2	1,4
A =	−25,33	−6,865	−3,27	−1,91	−1,201	−0,748	−0,36
B =	−637,3	−45,47	−10,87	−4,29	−2,178	−1,225	−0,70

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Slow-electron scattering from atoms

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For $x \gg 1$ and $\varphi = \sin(\beta x + \delta_0)$, $\delta_0 = -1.7B - \gamma + k\pi$ and $A = \tan 1.7\beta$ for $\beta > 1.8$ and $B = -\tan 1.7\beta$ for $\beta > 1.8$. The cross section is then calculated from the relation $\sigma = 4\pi \tan^2\delta_0 / k^2(1+\tan^2\delta_0)$. γ can either be determined from a point of the $\sigma(E)$ curve or from the binding energy of the negative ion. The mean electron collision frequency in the gas is determined from

$$\overline{\sigma v} = \frac{4\sqrt{T}}{\sqrt{2\pi m}} \int_0^\infty \sigma(Tx)\, x e^{-x} dx, \qquad (18)$$

where $x = E/T$; averaging is carried out over the Maxwell distribution. The results of numerical examples are in good agreement with the experimental $\sigma(E)$ curves. There are 1 figure and 1 table.

SUBMITTED: July 12, 1962

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ACCESSION NR: AP4042394 S/0056/64/047/001/0232/0239

AUTHOR: Smirnov, B. M.; Firsov, O. B.

TITLE: The interaction between negative ions and atoms

SOURCE: Zh. eksper. i teor. fiz., v. 47, no. 1, 1964, 232-239

TOPIC TAGS: negative ion energy, atom negative ion system, negative ion decay, ion decay cross section, resonance charge exchange, charge exchange cross section

ABSTRACT: The properties of a system resulting from a close encounter between an atom and a negative ion are investigated. It was assumed that interaction between an electron and an atom is significant in a restricted region of the order of atomic dimensions and that a weakly bound electron does not change the properties of an atom. The dependence of electron binding energy on the distance between the nuclei, when this distance is much greater than atomic size, was obtained. It appears that under certain conditions when an atom approaches a negative ion, the energy level of such a system (quasi-molecule) intersects with the boundary of a continuous spectrum.

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ACCESSION NR: AP4042394 S/0056/64/047/001/0232/0239

This made it possible to obtain a relation between the electron binding energy and the cross section of resonance charge exchange and the cross section for negative ion decay in atomic collisions. Investigation of a system consisting of atoms with spin 1/2 and an electron shows that, in general, the splitting of the energy level of an electron in a field of two widely separated identical atoms (ions) with spin 1/2 is half of that noted when the atoms have zero spin. This result is important in calculating the cross section of resonance charge exchange for slow collisions. The possibility of determining the binding energy of negative ions by means of experimental values of decay cross sections and charge exchange cross sections was also investigated for collisions between the negative ions and atoms. Orig. art. has: 18 formulas.

ASSOCIATION: none

SUBMITTED: 14Jan64 ATD PRESS: 3075 ENCL: 00

SUB CODE: NP NO REF SOV: 005 OTHER: 005

Card 2/2

SMIRNOV, B.M.; FIRSOV, O.B.

Interaction between negative ions and atoms. Zhur. eksp. i teor. fiz. 47 no.1:232-239 Jl '64. (MIRA 17:9)

L 12076-66 EWT(1)/T/EWA(m)-2 IJP(c)

ACC NR: AP6001776 SOURCE CODE: UR/0386/65/002/010/478/482

AUTHOR: Smirnov, B. M.; Firsov, O. B.

ORG: none

TITLE: Ionization of an atom colliding with an excited atom

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 10, 1965, 478-482

TOPIC TAGS: particle collision, ionization potential, excitation cross section, atomic structure

ABSTRACT: The authors calculate the cross section of the reaction

$$A^* + B \rightarrow A + B^+ + e, \qquad (1)$$

with the excitation potential of atom A exceeding the ionization potential I of atom B. The assumption is used that the cross section of transition (1) is determined essentially by collision impact parameters which greatly exceed the dimensions of the colliding atoms. Transition (1) is an important process occurring in the gas discharge of a gas laser. The authors show that if the atom A* is in a resonant excited state from which a transition to the ground state via dipole radiation is possible, then the cross section of process (1) is larger than in the case

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of the Penning effect. In calculating the cross section of process (1) it is assumed that the relative velocity v of the atom collisions is much smaller than the characteristic velocity of the electron in the atom. This makes it possible to obtain the probability per unit time of transition (1) with constant distance between nuclei (the frequency of the Auger effect of the quasimolecule). The case when the cross section of process (1) is determined by a transition occurring when the distance between the atoms is large, so that the perturbation operator can be expanded in powers of 1/R, is treated for two cases of practical interest: (i) when A* is a metastable atom, and (ii) when it corresponds to a resonant excited state of the atom, from which a transition to the ground state by dipole radiation is possible. In the first case the matrix element of the operator in terms of the wave functions of the ground and excited state of atom A is exponentially small at large distances between the atoms. This leads to a weak dependence of the cross section for the decay of the metastable atom on the velocity of collision with the other atom. When the excited state A* corresponds to the resonant state the analysis can be confined to the dipole-dipole interaction. The results are used to determine the cross section of the reaction

$$Hg(6^1P_1) + Li(Cs) \rightarrow Hg(6^1S_0) + Li^+(Cs^+) + e,$$

L 12076-66

ACC NR: AP6001776

which plays a definite role in magnetohydrodynamic generators operating with a lithium (cesium)-mercury mixture. The values obtained for the photoionization cross sections of lithium and cesium at 1500K are 1.02×10^{-14} cm^2 and 3.5×10^{-15} cm^2, respectively. The large values of the cross sections offer evidence of the correctness of the method used in their determination. Orig. art. has: 9 formulas.

SUB CODE: 20/ SUBM DATE: 28Sep65/ ORIG REF: 004/ OTH REF: 006

Card 3/3

SHIRKOV, B.N.; FIRSOV, O.B.

Ionization of an atom colliding with an excited atom. Pis'ma v red. Zhur. eksper. i teoret. fiz. 2 no. 10:478-482 N '65
(MIRA 19:1)

1. Submitted September 28, 1965.

L 36389-66 EWI(1) AT

ACC NR: AP6014038 SOURCE CODE: UR/0056/66/050/004/0975/0978

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B

AUTHOR: Lopantseva, G. B.; Firsov, O. B.

ORG: none

TITLE: Breakup of fast negative ions in inert gases

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 4, 1966, 975-978

TOPIC TAGS: negative ion, atom, inert gas, perturbation theory, elastic scattering, free electron

ABSTRACT: A problem of breakup of weakly bounded negative ions of the first periodic group in inert gases has been analyzed. The perturbation theory with the Fermi potential was applied in the calculations. The breakup cross section for a negative ion was found to be equal to the total elastic scattering cross section for slow free electrons on corresponding atoms of inert gases when the electron velocities are equal to the relative velocity of the colliding atomic systems. Orig. art. has: 2 figures and 6 formulas. [Based on author's abstract]. [NT]

SUB CODE: 20/ SUBM DATE: 14Oct65/ OTH REF: 005

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L 07876-67 EWT(1) AT

ACC NR: AP6030655 SOURCE CODE: UR/0020/66/169/006/1311/1313

27
B

AUTHOR: Firsov, O. B.

ORG: none

TITLE: Reflection of fast ions from a dense medium at glancing angles

SOURCE: AN SSSR. Doklady, v. 169, no. 6, 1966, 1311-1313

TOPIC TAGS: ion interaction, binding energy, small angle scattering, kinetic equation

ABSTRACT: The author determines the velocity distribution of the reflected ions when the incident ions have energies much greater than the binding energy of the reflecting medium, so that the principal role in the scattering is played by near-Coulomb interactions, corresponding to scattering at very small angles. The solution of the kinetic equation is obtained in this case by replacing the collision integral by an angular Laplace operator describing the directional diffusion of the particle velocity vector, and by a term describing the uniform deceleration of the particles. It is shown that the maximum distribution corresponds to the specular-reflection angle and that the form of the distribution does not depend on the concrete scattering mechanism, provided small-angle scattering prevails. The author thanks M. A. Leontovich for directly participating in the mathematical aspect of the work. This report was presented by Academician L. A. Artsimovich 1 December 1965. Orig. art. has: 12 formulas.

SUB CODE: 20/ SUBM DATE: 11Dec65/ OTH REF: 001

Card 1/1 bc UDC: 539.12.172 + 517.946

BENYAKOVSKIY, M.A.; GUTNIK, M.V.; TOROPOV, G.M.; BUTYLKINA, L.I.; REUTOV, Yu.G.; SHIKHANOVICH, B.A.; FIRSOV, P.A.; NAGAYEV, S.A.

Mastering the operation of the plant for cold-rolled sheet production. Stal' 25 no.8:726-730 Ag '65. (MIRA 18:8)

1. Cherepovetskiy metallurgicheskiy zavod.

FIRSOV, P.D.

Determination of the stages of malignant tumors of the upper respiratory tracts. Nauch. trudy Kaz. gos. med. inst. 14:567-568 '64. (MIRA 18:9)

1. Kafedra bolezney ukha, gorla i nosa (zav. - prof. N.N. Lozanov) Kazanskogo meditsinskogo instituta i Respublikanskaya klinicheskaya bol'nitsa (glavnyy vrach - K.L.Svechnikov) Ministerstva zdravookhraneniya Tatarskoy ASSR.

FIRSOV, P. I.

Dissertation defended for the degree of Candidate of Historical Sciences at the Institute of Slavic Studies (1962)

"Struggle of the Communist Party of Czechoslovakia for the Unity of the Working Class During the Economic Crisis of 1930-1933."

Vestnik Akad. Nauk, No. 4, 1963, pp 119-145

Firsov, P. V.

137-1957-12-23624

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 111 (USSR)

AUTHOR: Firsov, P. V.

TITLE: Experimental Investigation of Methods of Determining the Friction Coefficient During the Rolling of Metal (Eksperimental'noye issledovaniye metodov opredeleniya koeffitsiyenta treniya pri prokatke)

PERIODICAL: Tr. Donetsk. industr. in-ta, 1957, Vol 19, pp 9-17

ABSTRACT: In order to determine the friction coefficient (CF) in the rolling of steel of the STZ type, experiments were carried out in accordance with three different methods in a rolling mill equipped with cast-iron rolls of 290 mm diameter. In determining the CF by means of the critical angle (A) at which the steel (heated to 1040-1080°) is gripped, it was found that the critical A of grip is equal to 22-22° 10'. This A corresponds to a CF of 0.404 - 0.407 at the moment of the initial grip. In determining the CF by means of the forward flow use was made of the core method and the CF was computed in two ways: 1) the value of the neutral angle was determined by means of the Fink formula and the A of F was computed with the aid of the Pavlov formula;

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137-1957-12-23624

Experimental Investigation of Methods of Determining the Friction (cont.)

2) Chekmarev's formula was used to determine the value of the neutral A. In order to determine the CF from the established neutral A, use was made of a formula derived from the condition of equilibrium of the forces at the seat of the deformation, taking into account the widening in the zone of the forward flow and assuming the pressure to be constant along the arc of the grip. It is established that the neutral angle increases with the A of grip, as long as the latter is larger than the AF, and then diminishes. When the A of grip reaches 25-26° the CF increases, passes through an extended maximum up to 30° and decreases thereafter. It was discovered that the CF is greater when the A of seizure is small. The CF in a steady-state operation is always smaller than at the instant of grip. In the process of determining the CF by the vise-method, the value of the CF increased from 0.28 to 0.325 with an increase of the A of grip from 16°40' to 34°. The decreased value of the CF is explained by the fact that the presence of the rear tension increases the velocity of the slippage. In order to determine the maximum A of grip during rolling, use may be made of the CF established by means of the critical A of grip.

Card 2/2 1. Metals-Rolling 2. Friction coefficient-Determination P. G.

f 1A'56 L, F V.

DONSKOY, A.V., doktor tekhn. nauk, prof; FIRSOV, P.V., inzh.

Thermal calculations for surface induction heating. Vest. mash. 37 no.8:65-70 Ag '57. (MLRA 10:9)
(Induction heating) (Metals--Heat treatment)

YEKTOV, I.M.; ZARUYEV, V.M.; GUROV, S.A.; REVENKO, I.F.; V rabote prinimali uchastiye : KALMANOVICH, Yu.R.; GRIGOR'YEV, F.N.; KOSHELENKO, A.M.; LITVINENKO, Yu.P.; DMITRIYEV, V.D.; POLYAKOV, V.V.; PETUSHKOV, Ye.S.; FIRSOV, P.V.

Rolling double bulb-bar shapes with longitudinal cutting in the finishing mill. Stal' 20 no. 12:1113-1115 D '60. (MIRA 13:12)

1. Stalinskiy metallurgicheskiy zavod i Donetskiy politekhnicheskiy institut.
(Rolling (Metalwork))

DONSKOY, A.V., doktor tekhn. nauk; FIRSOV, P.V., inzh.; PRUSS-ZHUKOVSKAYA, I.N., inzh.

Induction heating of the oil lines of hydraulic lifts. Elek. sta. 34 no.10:48-50 O '63. (MIRA 16:12)

DONSKOY, A.V., doktor tekhn. nauk; FIRSOV, P.V., inzh.

Inductive heating of hydraulic metal structures. Elek sta. 35 no.10:31-34 O'64. (MIRA 17:12)

FIRSOV, S

112-3-6066

Translation from: Referativnyy Zhurnal, Elektrotekhnika, 1957, Nr 3, p. 147 (USSR)

AUTHORS: Vdovin, N., Firsov, S.

TITLE: Feeding of the Carbon-feed Electric Motors of the K T-1 [Motion Picture Projector] in A-C Supplying the Arc Lamp (Pitaniye elektrodvigateley podachi ugley K⌐T-1 pri pitanii dugi peremennym tokom)

PERIODICAL: Kinomekhanik, 1956, Nr 3, pp. 37-38

ABSTRACT: It is well known that the arc lamp of the K⌐T-1 motion picture projector is designed for d-c operation. When the lamp is operated on alternating current, automatic carbon feed is impossible. The proposed system includes a selenium rectifier for insuring automatic operation of the arc lamp. B.S.T.

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BOGATENKOV, V.F.; VAYNSHTEYN, O.Ya.; ZVEREV, B.F.; FIRSOV, S.G.

Improving the method of phosphorus removal during steel smelting.
Metallurg 6 no.11:11-13 N '61. (MIRA 14:11)

1. Chelyabinskiy metallurgicheskiy zavod i Chelyabinskiy naushno-issledovatel'skiy institut metallurgii.
(Steel--Metallurgy)

ALYM, L.A., inzh.; VAYNSHTEYN, O.Ya., inzh.; KEYS, N.V., inzh.; LUBENETS, I.A., inzh.; SMIRNOV, Yu.D., inzh.; FIRSOV, S.G., inzh.

Production of St. 5ps semikilled steel for concrete reinforcements. Stal' 23 no.4:320-321 Ap '63. (MIRA 16:4)
(Steel, Structural—Metallurgy) (Concrete reinforcements)

MOROZOV, A.N.; CHIRKOV, N.A.; FIRSOV, S.G.; KRASHCHENKO, L.S.; Prinimali uchastiye: RISPEL', K.N.; VAYNSHTEYN, O.Ya.; BUSHUYEV, A.P.; SNEZHKO, B.Ya.; MEL'NICHENKO, A.A.; ZHURAVLEV, V.M.

Alloying open-hearth steel with exothermic ferroalloys in the ladle. Stal' 25 no.5:412-414 My '65. (MIRA 18:6)

FIRSOV, S.I.

Spring suspension of freight cars with friction absorbers.
Biul.tekh.-ekon.inform. no.2:57-59 '58. (MIRA 11:4)
(Railroads--Freight cars)

FIRSOV, S.I.

Four-axle covered freight cars with 750 mm wheel track. Biul. tekh.-ekon.inform. no.12:62-64 '58. (MIRA 11:12)
(Railroads--Freight cars)

FIRSOV, S.I.

Three-car section with mechanical refrigeration and electric heating. Biul. tekh.-ekon. inform. no.3:70-72 '58. (MIRA 11:6)
(Refrigirator-cars)

FIRSOV, S.I.

New brake air distributors. Biul. tekh.-ekon. inform. no.3:72-74 '58. (MIRA 11:6)

(Air brakes)

FIRSOV, S.I.

Train for tank cars washing and steaming. Biul.tekh.-ekon.inform. no.3:57-58 '60. (MIRA 13:6)
(Tank cars--Maintenance and repair)

PIRSOV, S.I.

New containers used in railroad freight transportation. Biul.tekh.-ekon.inform. no.9:66-68 '60. (MIRA 13:10)
(Containers) (Railroads--Freight)

KRIVORUCHKO, Nikolay Zakharovich, kand. tekhn. nauk; SLUSHAYENKO, A.M., dotsent, retsenzent; YELISEYEV, F.G., dots., retsenzent; LERNET, K.S., dots., retsenzent; GLUKHOV, V.A., dots., retsenzent; KIYANOV, P.I., inzh., retsenzent; TSIMIDANOV, V.M., inzh., retsenzent; DOROFEYEV, V.G., inzh., retsenzent; KALEDENKOV, S.S., inzh., retsenzent; KOROLEV, A.N., inzh., retsenzent; LOKSHIN, Kh.A., inzh., retsenzent; FIRSOV, S.I., inzh., retsenzent; SHAKURSKIY, K.D., inzh., retsenzent; UTKIN, A.V., tekh., retsenzent; VALETOV, A.I., inzh., red.; BOBROVA, Ye.N., tekhn. red.

[Operation, management, and repair of rolling stock] Vagonnoe khoziaistvo. Moskva, Vses.izdatel'sko-poligr.ob"edinenie M-va putei soobshcheniia, 1961. 319 p. (MIRA 14:11)

1. Kafedra "Konstruktsiya, remont i ekspluatatsiya vagonov" Rostovskogo instituta inzhenerov zheleznodorozhnogo transporta (for all except Valetov, Bobrova).
(Railroads—Rolling stock)

S/193/61/000/003/008/009
A004/A101

AUTHOR: Firsov, S. I.

TITLE: Four-axle 60 m^3 capacity railroad tank car of frameless design

PERIODICAL: Byulleten' tekhniko-ekonomicheskoy informatsii, no. 3, 1961, 63-65

TEXT: On the order of the Ministry of Transportation the new frameless 60 m^3 capacity tank car was designed and built in 1960 at the Zhdanovskiy zavod tyazhelogo mashinostroyeniya (Zhdanov Plant of Heavy Machinery). In contrast to the existing tank cars the new model has no solid frame structure. The traction force of the locomotive is taken up by the tank itself, which is a welded structure mounted on two welded metal semi-frames. The thickness of the lower tank plates has been increased to 12 mm. The design of the tank car has been altered somewhat to place the automatic coupling equipment, which made it possible to lower the center of gravity of the tank car by 188 mm compared to the existing 60-ton tank cars and by 62 mm in comparison with the 50-ton tank cars. The braking equipment is mounted on brackets welded or to the lower plate of the tank. The tank is equipped with an outer and inner ladder and a 400 x 1,000 mm platform. The following technical specifications are given: length between the

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axes of the automatic couplings - 12.020 mm; base - 7.800 mm; length of tank - 10.390 mm; tank diameter - 2.800 mm; tank capacity (total and useful) - 61.2 and 60.0 m^3; load capacity - 60 tons; tare coefficient - 0.366; tare - 21.9 tons. The new frameless structure made it possible to reduce the tare weight by 5.6%, mainly owing to the elimination of the ridge beam and the lateral channel beams, and to decrease the load from the axles to the rails and the load on 1 running meter of rails. The new tank cars are fitted with the new automatic MTZ- 270 - 002 (MTZ - 270 - 002) brakes and a universal overflow device which makes it possible to transport both clear and dark petroleum products. Static, impact and dynamic tests carried out by the Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta (All-Union Scientific Research Institute of Railroad Transportation) at speeds exceeding 125 km/h proved the new frameless tank car to be superior to the existing ones, since it has better dynamic properties, a reduced tendency to rolling and an improved ratio of vertical to lateral forces, which determines the degree of stability of the wheel pairs. There is 1 figure.

FIRSOV, S.I.

Improved four-axle boxcar. Biul. tekh.-ekon. inform. no. 4:68-69 '61. (MIRA 14:5)

(Railroads--Freight cars)

FIRSOV, S.I.

The 93 to 100 ton capacity bogie for railroad cars. Biul.tekh.-ekon.inform. no.2:67-68 '62. (MIRA 15:3)
(Railroads--Freight cars)

FIESOV, S.I.; BRAYLOVSKIY, N.G., inzh., red.; MEDVEDEVA, M.A., tekhn. red.

[Progressive organization of the work of technical inspection points] Peredovaia organizatsiia raboty punktov tekhnicheskogo osmotra. Moskva, Transzheldorizdat, 1963. 129 p. (MIRA 16:10)

(Railroads--Management)

FIRSOV, V.D., inzh.

Two-way braking of the turntable. Elek. i tepl.tiaga no.8:28 Ag '63. (MIRA 16:9)

1. Lokomotivnoye depo Saratov II.
(Railroads--Repair shops)

FIRSOV, V.D.

Case of spontaneous perforation of a chylous cyst of the mesentery of the small intestine. Khirurgiia no.12:118 '61. (MIRA 15:11)

1. Iz khirurgicheskogo otdeleniya (zav. - A.S. Krysov) Michurinskoy zheleznodorozhnoy bol'nitsy (nachal'nik V.N. Korotkov).
(MESENTERY--DISEASES) (CYSTS)

FIRSOV, V.D. (Tambovskaya oblast', Michurinsk, ul. Gogolevskaya, d.57a, kv.7)

Operation due to a gigantic liver echinococcus in a 75-year-old patient. Klin.khir. no.9:69 S '62. (MIRA 16:5)

1. Khirurgicheskoye otdeleniye Staro-Yur'yevskoy rayonnoy bol'nitsy Tambovskoy oblasti.
(LIVER--HYDATIDS) (LIVER--SURGERY)

FIRSOV, V.D.

Case of cancer of the small intestine. Khirurgiia 39 no.6:134-135 Je '63. (MIRA 17:5)

1. Iz khirurgicheskogo otdeleniya Michurinskoy zheleznodorozhnoy bol'nitsy (nachal'nik V.N. Korotkov).

KORKTKOV, V.N.; FIRSOV, V.D. (Michurinsk, Tambovskoy oblasti, Gogolevskaya ul. 57-a, kv. [illegible])

Torsion of the spleen. Vest. khir. 92 no.1:87 Ja '64. (MIRA 17:11)

1. Iz khirurgicheskogo otdeleniya Michurinskoy zheleznodorozhnoy bol'nitsy (nachal'nik - V.N. Korotkov).